

MULTIMEDIA



UNIVERSITY

STUDENT ID NO

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# MULTIMEDIA UNIVERSITY

## FINAL EXAMINATION

TRIMESTER 3, 2018/2019

**PMT0204 – FUNDAMENTAL MATHEMATICS II**

(All sections / Groups)

30 May 2019  
2.30 p.m – 4.30 p.m  
( 2 Hours )

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### INSTRUCTIONS TO STUDENTS

1. This question paper consists of THREE (3) printed pages with 4 questions only.
2. Answer all FOUR (4) questions.
3. Write all your answers in the answer booklet provided.
4. Only NON-PROGRAMMABLE calculators are allowed.

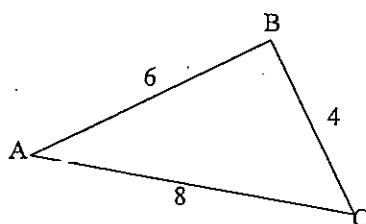
**Question 1 (25 Marks)**

- a) If  $A = \begin{bmatrix} 1 & -2 \\ 4 & 1 \end{bmatrix}$     $B = \begin{bmatrix} a & 2 \\ b & 1 \end{bmatrix}$  find the values of  $a$  and  $b$  such that  $\mathbf{AB} = \mathbf{BA}$ .  
(6 marks)
- b) Find  $\begin{pmatrix} 1 & 0 & 2 \\ -3 & 2 & 0 \end{pmatrix} \begin{pmatrix} 1 & 2 \\ 2 & 1 \\ 5 & 5 \end{pmatrix}$   
(3 marks)
- c) Given the determinant  $\begin{vmatrix} -3 & 1 & 2 \\ 2 & x+1 & 2 \\ 2 & 1 & x+2 \end{vmatrix} = 0$ , find the value(s) of  $x$ .  
(6 marks)
- d) Solve the following system of equation using the Cramer's rule.  

$$\begin{aligned} 2x + y + z &= 1 \\ x - 2y - 3z &= 1 \\ 3x + 2y + 4z &= 5 \end{aligned}$$
  
(10 marks)

**Question 2 (25 Marks)**

- a) If  $\cos \theta = \frac{2}{3}$  find  $\cot \theta$ .  
(4 marks)
- b) Graph the sinusoidal function  $y = 2\cos\left(\frac{\pi}{2}x + \pi\right) + 1$ . State the amplitude, period and phase shift.  
(7 marks)
- c) Solve the equation  $2\sin^2\theta + 7\cos\theta - 5 = 0$  for  $0 \leq \theta \leq 2\pi$ .  
(9 marks)
- d) In the triangle shown below, find the measure of angle A.  
(5 marks)

**Continued...**

**Question 3 (25 Marks)**

a) Evaluate

i.  $\lim_{x \rightarrow 0} \left( \frac{3x^2+x-2}{2x^3+5x+3} \right)$  (2 marks)

ii.  $\lim_{x \rightarrow \infty} \left( \frac{2x^2+1}{5x+2x^2} \right)$  (3 marks)

b) Find the derivative of the following functions:

i.  $y = x^3 e^{2x}$  (5 marks)

ii.  $y = \ln(x - x^5)$  (6 marks)

c) Given  $f(x) = x^4 - 4x^3 + 10$ , find where the graph of  $f$  is increasing, decreasing, concave up and concave down.

(9 marks)

**Question 4 (25 Marks)**

a) Integrate  $\int \left( 2e^{2x} + \frac{1}{x+5} - 4x \right) dx$ . (5 marks)

b) Evaluate  $\int_0^1 \left( \frac{x+2}{x^2-1} \right) dx$  by using partial derivative technique. (10 marks)

c) Calculate the area of the region enclosed by the line  $y = x + 1$  and the curve  $y = x^2 - 2x + 1$ . Sketch the area of the graph and show the intersection points.

(10 marks)

**End of Page**

**FORMULA****A. Trigonometric Identities****Pythagorean Identities**

$$\cos^2 A + \sin^2 A = 1 \quad \sec^2 A = 1 + \tan^2 A \quad \csc^2 A = 1 + \cot^2 A$$

$$\text{Law of sines} \quad \frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c} \quad \begin{aligned} a^2 &= b^2 + c^2 - 2bc \cos A \\ \text{Law of cosines} \quad b^2 &= a^2 + c^2 - 2ac \cos B \\ &c^2 = a^2 + b^2 - 2ab \cos C \end{aligned}$$

**B. Differentiation Rules****Product-to-Sum Formulas**

$$\frac{d}{dx}[x^n] = nx^{n-1}; n \text{ is any real number}$$

$$\frac{d}{dx}[f(x) \cdot g(x)] = f(x)g'(x) + f'(x)g(x); \text{ The Product Rule}$$

$$\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] = \frac{g(x)f'(x) - f(x)g'(x)}{[g(x)]^2}; \text{ The Quotient Rule}$$

$$\frac{d}{dx}f(g(x)) = f'(g(x)) \cdot g'(x); \text{ The Chain Rule}$$

$$\frac{d}{dx}[g(x)]^n = n[g(x)]^{n-1} \cdot g'(x); \text{ The power rule combined with the chain rule}$$

$$\frac{d}{dx}[\sin x] = \cos x \quad \frac{d}{dx}[\cos x] = -\sin x \quad \frac{d}{dx}[\tan x] = \sec^2 x$$

$$\frac{d}{dx}[\sec x] = \sec x \tan x \quad \frac{d}{dx}[\cot x] = -\csc^2 x \quad \frac{d}{dx}[\csc x] = -\csc x \cot x$$

$$\frac{d}{dx}[e^x] = e^x \quad \frac{d}{dx}[\ln x] = \frac{1}{x}; \quad x > 0$$

**C. Basic Integration Formulas**

$$\int cf(x) dx = c \int f(x) dx$$

$$\int k dx = kx + C$$

$$\int [f(x) \pm g(x)] dx = \int f(x) dx \pm \int g(x) dx$$

$$\int x^n dx = \frac{x^{n+1}}{n+1} + C, \quad n \neq -1$$

$$\int e^x dx = e^x + C$$

$$\int \frac{1}{x} dx = \ln|x| + C$$

$$\text{Integration by-parts: } \int u dv = uv - \int v du$$

$$\text{Volume (disk)} = \pi \int_a^b (f(x))^2 dx$$

$$\text{Area} = \int_a^b (f(x) - g(x)) dx$$

$$\text{Volume (washer)} = \pi \int_a^b [(f(x))^2 - (g(x))^2] dx$$